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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] This invention relates to the image processing system which changes a full color picture into a monochrome picture in a personal computer, a word processor, etc.
[0002]
[Description of the Prior Art] Conventionally, if not only a monochrome (colorless) monochrome picture but arbitrary colors were specified when a full color picture was changed into a monochrome picture in image processing systems, such as a personal computer, although it is made to change into the monochrome picture of the specified color, when specifying arbitrary colors, the following procedures were performing. That is, while operating the pointing device and directing image edit of a color picture, color specification was performed by pointing to color tone amendment and directing the hue, saturation, and lightness after that according to the color for which it asks. Thus, specification of arbitrary colors changes a full color picture into the monochrome picture of a specification color according to an image-processing program.
[0003]
[Problem(s) to be Solved by the Invention] However, in the former, while needing the above complicated operations, since the advanced knowledge about a color was needed, a hue, saturation, lightness, etc. had applied the big burden to the operator. Moreover, since an image-processing program analyzed the specified hue, saturation, and lightness and it was made to specify a specification color according to the analysis result, it caused huge-ization of a program and also had the problem that processing efficiency became bad so much. The technical problem of this invention is enabling it to change into the monochrome picture of the color which asks for a full color picture by easy operation near one-touch or it efficiently.
[0004]
[Means for Solving the Problem] The means of this invention is as follows. In the image processing system which changes a full color picture into a monochrome picture, (1) and a specification means specify arbitrary colors alternatively out of various kinds of colors decided beforehand, and perform color specification by operating a keyboard and a pointing device for example.
(2) and a calculation means scan each pixel which constitutes the aforementioned color picture, and compute brightness from the color component. Here, a color picture may be a YMC picture for printing which uses as a color component not only the RGB picture for a display that uses red-green blue as a color component but yellow, a Magenta, and cyanogen.
(3) and a conversion means change the brightness computed by this calculation means into the color component of the specification color specified by the aforementioned specification means.
(4) and a substitution means transpose the color component of each pixel which constitutes the aforementioned color picture to the color component of a specification color into which it was changed by the aforementioned conversion means. In addition, when arbitrary keys are operated among the color

specification keys prepared corresponding to various kinds of colors decided beforehand, you may make it the aforementioned specification means specify the color corresponding to the key concerned. Moreover, it matches with various kinds of aforementioned colors, is prepared, respectively, and has two or more translation tables which change into the color component of a single color the brightness computed by the aforementioned calculation means, and the brightness computed by the aforementioned calculation means may make the aforementioned conversion means change to the color component of the aforementioned specification color by referring to the translation table corresponding to the aforementioned specification color among two or more aforementioned translation tables. Moreover, while the aforementioned conversion means changes into the color component corresponding to two or more aforementioned specification colors the brightness computed by the aforementioned calculation means, respectively, it may make change it into the color component of the mixed color which mixed two or more aforementioned specification colors by combining each changed color component according to the rule which was able to be decided beforehand, when two or more colors are specified by the aforementioned specification means. Furthermore, when two or more colors are specified by the aforementioned specification means, while the aforementioned conversion means changes into the color component corresponding to two or more aforementioned specification colors the brightness computed by the aforementioned calculation means, respectively Each changed color component is compared for every component, and you may make it change into the color component of the mixed color which mixed two or more aforementioned specification colors by extracting and combining the largest value out of it. In changing a full color picture into a monochrome picture now, it specifies arbitrary colors out of various kinds of colors decided beforehand. Then, since each pixel which constitutes a color picture is scanned and brightness is computed from the color component (for example, RGB value), a conversion means changes this brightness into the color component of a specification color. The color component of each pixel which constitutes a color picture by this is transposed to the color component of the changed specification color. Therefore, it is efficiently convertible for the monochrome picture of the color which asks for a full color picture by easy operation near one-touch or it.

[0005]

[Embodiments of the Invention]

(The 1st operation gestalt) With reference to drawing 1 - drawing 6 , the 1st operation gestalt of this invention is explained hereafter. Drawing 1 (A) is the block block diagram of an image processing system. CPU1 is arithmetic and program control which controls operation by this whole image processing system according to the program in internal storage 2. Internal storage 2 consists of RAM, a cache memory, ROM, etc., and a called program and data are loaded to internal storage 2 from external storage 3. In addition, external storage 3 may be the memory card with which magnetic / an optical storage medium, or semiconductor memory is consisted of, and it equips free [attachment and detachment], a floppy disk, an add-in board, etc. Moreover, you may receive and memorize the program and data which have been transmitted from other devices through a communication line.

[0006] The input section 4 has the composition of having POINTIGU devices, such as key input equipment equipped with various kinds of function keys, cursor keys, etc., and a mouse. Here, in case a full color picture is changed into a monochrome picture, in order to choose the color of a monochrome picture, arbitrary colors are specified by key input out of various kinds of colors decided beforehand. In this case, various kinds of colors which are the candidates for selection are matched with the function key by 1:1, and perform color specification by operating arbitrary function keys. That is, a function key is arranged on a touch screen and performs color specification by carrying out the touch input of the function key of the color which inspects visually and asks for the function name display on the display screen (color name). In addition, it is made to specify one arbitrary color out of eight kinds of colors in this case.

[0007] The picture input section 5 is constituted by the digital camera and the image scanner. In addition, a digital camera is the electronic still camera or video camera which carries out analog-to-digital conversion while carrying out photo electric translation of the photographic subject image received by the solid state image pickup device, and image scanners are image sensors which scan

printed matter etc. and obtain a digital image, and are connected removable to the image processing system. And the picture input section 5 inputs a full color picture, generates the color picture for printing and makes it to make the displays 6, such as a liquid crystal display, indicate by multicolor, or to answer printing instructions from the input section 4, to carry out RGB/YMCK conversion of this full color picture, and it carry out process printing from the printing sections 7, such as a thermal printer, while CPU1 incorporates the full color picture inputted from the picture input section 5 and stores it in internal storage 2.

[0008] Drawing 1 (B) is what showed a part of RAM8 which constitutes internal storage 2, and an image memory 8-1 is image memory which stores the image data by which external supply was carried out through external storage 3 or communication lines, such as image data, a floppy disk, etc. which were inputted from the picture input section 5, as a bit map image data for every RGB. In case the specification color register 8-2 changes a full color picture into the monochrome picture of arbitrary colors, it is a register which stores temporarily the color specified by the key stroke. Although a cursor key is operated and the conversion range is specified here in case a full color picture is changed into a monochrome picture, in that case, the starting position coordinate transformation range register 8-3 stores temporarily the starting position coordinate of the specified conversion range, and the end position-coordinate conversion range register 8-4 is a register for storing the end position coordinate temporarily. The monochrome color translation table 8-5 is a table referred to in case a full color picture is changed into the monochrome picture of a specification color, and eight kinds of monochrome color translation tables 8-5 are formed by matching with eight kinds of colors beforehand decided as a candidate for selection of a specification color 1:1. Drawing 2 is what showed a part of monochrome color translation table 8-5, drawing 2 (A) shows the monochrome color translation table 8-5 corresponding to "blue", and (B) shows the monochrome color translation table 8-5 corresponding to "red." The monochrome color translation table 8-5 has the composition of memorizing a RGB value (256 gradation) corresponding to the brightness value of 256 gradation. CPU1 accesses the monochrome color translation table 8-5 corresponding to the content of the specification color register 8-2 here out of eight kinds of monochrome color translation tables 8-5. Although a full color picture is changed into the monochrome picture of a specification color by referring to the content of this monochrome color translation table 8-5 In that case, CPU1 scans each pixel which constitutes a full color picture, computes brightness from the RGB value, searches the monochrome color translation table 8-5 based on this brightness, and calculates the RGB value of a specification color. The work memory 8-6 has X register and Y register which memorize the scanning coordinate which scans a full color picture for every pixel. Here, CPU1 scans at a time the conversion range of 1 pixel shown among the full color pictures in an image memory 8-1 according to the content of the starting position coordinate transformation range register 8-3 and the end position-coordinate conversion range register 8-4, updating the value of X register and Y register one by one.

[0009] Next, operation at the time of changing a full color picture into a monochrome picture in this image processing system is explained with reference to the flow chart shown in drawing 3 and drawing 4 . In addition, the program for realizing each function described by this flow chart is the gestalt of the program code which CPU1 can read, is memorized by internal storage 2 fixed, or is loaded to internal storage 2 from external storage 3. Now, each function key is assigned to the processing facility as shown in drawing 5 ** in the image-processing waiting state (primitive state) (Step A1). Here, if a function key F4 is operated and image edit is directed, each function key is assigned to a processing facility as shown in drawing 5 **, and will be in the state waiting for selection of image edit (Step S2).

[0010] Here, if a function key F9 is operated in order to specify the processing which changes a full color picture into a monochrome picture, it will become the specification color waiting of into what color to make a monochrome picture (Step A3). In this case, since eight kinds of colors beforehand decided as a color for selection are matched with 1:1, function keys F1-F8 come to function as a color specification key, respectively. Drawing 6 shows the function key in this case, and function keys F1-F8 are matched with "black", "yellow", "red", "blue", a "sour orange", "green", "purple", and "sepia." In addition, a function key F9 functions as execution which directs the end of color specification. Here, if

any or one key is operated among function keys F1-F8, the color code corresponding to the key concerned will be set to the specification color register 8-2 in RAM8 as a specification color (Step A4). Thus, if color specification is performed, CPU1 will serve as starting position specification waiting of the conversion range (step A5).

[0011] If an execution key is operated after setting cursor to the starting position of the conversion range since cursor is moved onto the display screen (Step A6) whenever a cursor key is operated now, CPU1 will incorporate the present cursor location coordinate as a starting position coordinate, and will set it to the starting position coordinate transformation range register 8-3 (Step A7). Next, it becomes the end tab-control-specification waiting of the conversion range (Step A8), and similarly, if an execution key is operated, operating a cursor key after setting to the position which asks for cursor (step A9), CPU1 will incorporate the present cursor location coordinate as an end position coordinate, and will set it to the end position-coordinate conversion range register 8-4 (Step A10). The display screen shown in drawing 5 is what showed the state where the arbitrary fields of an image display within the limit were specified as a conversion range, and when specifying the conversion range of rectangular, it is performed by specifying two points, the upper left coordinate and lower right coordinate, as mentioned above. And it progresses to Step A11 of drawing 4 , and becomes the execution waiting of transform processing.

[0012] Here, if an execution key is operated, CPU1 will scan the full color picture stored as a candidate for conversion in the image memory 8-1, and will acquire a RGB value (Step A12). First, in order to scan the upper left pixel of conversion within the limits among each pixel which constitutes a full color picture, CPU1 sets the value of the starting position coordinate transformation range register 8-3 to X register and Y register, and acquires the RGB value of the pixel specified with this X register and Y register. And the brightness K of the pixel is computed according to the following formula from this RGB value. While specifying the monochrome color translation table 8-5 corresponding to the content of the specification color register 8-2 among "8+G [K=3R/8+B/]/2", next eight kinds of monochrome color translation tables 8-5 (Step A14), based on the computed brightness, the monochrome color translation table 8-5 concerned is searched, and a corresponding RGB value is acquired (Step A15). When a brightness value is now and a specification color is "129" in "red", "R= 255, G= 2, B= 2" are read from the monochrome color translation table 8-5 shown in drawing 2 (B) as a "red" RGB value.

[0013] Thus, replacement of a RGB value is performed between the RGB value of the specification color acquired from the monochrome color translation table 8-5, and the RGB value of the original full color picture (Step A16). That is, the RGB value of the pixel (it is the upper left pixel of conversion within the limits at first) shown with the value of X register and Y register is replaced with the RGB value of the specification color obtained by referring to the monochrome color translation table 8-5. And although it confirms whether the lower right pixel of conversion within the limits was specified (Step A17), it is carried out by detecting whether the value of X register and Y register became equal to the value of the end position-coordinate conversion range register 8-4 in this case. Since it is the case where the upper left pixel is specified now, the value of X register and Y register is updated and the following pixel is specified (Step A18). And the RGB value of the specification pixel concerned is acquired (Step A12), and the same processing is hereafter repeated for every pixel. If the full color picture of conversion within the limits is changed one by one into the monochrome picture of a specification color by this and it finishes changing all to the lower right pixel of the range by it (Step A17), the display output of the changed monochrome picture will be carried out (Step A19). And it will return to Step A1 and will be in a primitive state. Here, if a function key F8 is operated, hard copy of the monochrome picture on the display screen will be carried out, and if a function key F5 is operated, registration preservation of it will be carried out at external storage 3.

[0014] It becomes possible to simplify an image-processing program so much as mentioned above, while being able to change into the monochrome picture of the color which asks for a full color picture by very easy operation since the color matched with the function key is chosen as a specification color, as the one-touch input of the function key is carried out, in case it specifies in what single color a monochrome picture is expressed in this image processing system. Moreover, the monochrome color translation table 8-5 is formed for every color of the various kinds beforehand decided as a candidate for

selection, and since it was made to perform conversion in a monochrome picture from the inside with reference to the monochrome color translation table 8-5 corresponding to a specification color, it becomes possible to also perform transform processing efficiently.

[0015] (The 2nd operation gestalt) With reference to drawing 7 - drawing 10 , the 2nd operation gestalt of this invention is explained hereafter. In addition, if two or more colors are chosen out of various kinds of colors decided beforehand, it is made to change into the monochrome picture of the mixed color which mixed the selected color in this 2nd operation gestalt. Drawing 7 and drawing 8 are the flow charts which showed operation at the time of changing a full color picture into the monochrome picture of a specification color. First, although it will be in the same state waiting for a key input as Steps A1 and A2 of drawing 3 , the illustration ellipsis has been carried out in drawing 7 . If image edit is now directed from a primitive state, it will progress to Step B1 and will become the waiting for color specification. Here, as shown in drawing 9 , each function keys F1-F8 function as a color specification key like the case of the 1st operation gestalt mentioned above. Moreover, the subwindow which shows the specification state of a mixed color opens, and a list indication of the name of each color corresponding to function keys F1-F8 is given.

[0016] Here, if one of function keys is operated in order to specify arbitrary colors, although it is the same as that of the case of drawing 3 that the color corresponding to the key is set to the specification color register 8-2 (step B-2), the inverse video of the name in the above-mentioned subwindow corresponding to a specification color is carried out (Step B3). And it returns to Step B1, and whenever arbitrary colors are specified, Steps B1-B3 are repeated. Here, the content of a display of a subwindow shown in drawing 9 shows the state where "purple" was chosen with "red." Thus, if two or more colors are specified and a function key F9 (execution key) is operated, and it progresses to Step B4, whether two or more colors were specified checks and it is not specified, it returns to Step B1. In addition, when operating a function key and specifying two or more colors, you may make it specify two or more colors at once by carrying out simultaneous push of the two or more [besides in the case of operating one function key at a time] keys. If "red" and "purple" should be specified now, it will progress to step B5 and conversion range specification processing will be performed. Since this range specification processing is the same as that of step A5-A10 of drawing 3 , the illustration ellipsis of the detail has been carried out.

[0017] And if it will be in an execution waiting-acknowledgement state (step B6) and an execution key is operated, operation which changes a full color picture into a monochrome picture will be started. Here, Steps B7 and B8 are the same processings corresponding to Steps A12 and A13 of drawing 3 , acquire a RGB value from the pixel of the full color picture shown with a coordinate (X, Y), and calculate brightness from this RGB value. And the RGB value of the pixel shown with a coordinate (X, Y) is reset to "0", respectively (Step B9). In addition, this processing is performed as pretreatment of comparison processing of the RGB value mentioned later. Next, although it progresses to Step B10 of drawing 8 , since two or more colors are set to the specification color register 8-2 in this case, first, the color of the head is called and the monochrome color translation table 8-5 corresponding to it is specified. And with reference to this monochrome color translation table 8-5, the RGB value of the specification color corresponding to the computed brightness is acquired (Step B11).

[0018] Next, the size of the RGB value (picture RGB value) of the full color picture scanned with the coordinate (X, Y) and the RGB value (acquisition RGB value) acquired from the monochrome color translation table 8-5 is compared for every color component (Step B12). That is, a picture RGB value and an acquisition RGB value are investigated ["R", "G", and] for whether the acquisition RGB value is larger than a picture RGB value as compared with every "B." Since all picture RGB values are reset by "0" at first, with [an acquisition RGB value] "1", it progresses to Step B13 and processing which rewrites a picture RGB value to an acquisition RGB value is performed. [more than] For example, if the "blue" RGB values acquired from the monochrome color translation table 8-5 are "0, 0,255" as shown in drawing 10 , the color component B of a picture will be rewritten by "255."

[0019] Next, it investigates whether there are any remaining specification colors with reference to the specification color register 8-2 (Step B14), and if it is, the next color in the specification color register 8-

2 will be specified (Step B15). And it returns to Step B10 and the same operation is repeated hereafter. As now shown in drawing 10 , "red" should be specified as a following color, and the RGB value "255, 0, 0" should be acquired from the monochrome color translation table 8-5. Since the picture RGB value is "0, 0,255" at this time, the value of the color component R of a picture is transposed to the value "255" of Acquisition R (Step B13). By this, a picture RGB value turns into a RGB value of the mixed color which mixed 2 Colors of "blue" and "red" "255, 0, 0." And if it remains at Step B14 and nothing ****** of the specification color is carried out, the following pixel will be returned to Step B7 specification (Step B17) and the following until it investigates whether processing finished (Step B16) and ends to the last pixel (lower right pixel) of the conversion range, and the operation as **** with 1 pixel same at a time will be repeated. And if processing finishes to a lower right pixel, the display output of the monochrome picture will be carried out (Step B18).

[0020] In this case, a monochrome picture carries out a display output to the mixed color which mixed two or more colors specified arbitrarily. Thus, since the monochrome picture of the mixed color which combined it by specifying two or more colors out of eight kinds of colors currently assigned to function keys F1-F8 as a candidate for selection is outputted, it becomes possible to extend the selection range of a color sharply not only according to eight kinds but according to its combination. Moreover, if two or more function keys are pushed simultaneously and two or more colors are specified as mentioned above, specification of a mixed color will be attained in an one-touch input.

[0021] In addition, if the brightness is reversed when each pixel which constitutes a full color picture is scanned and brightness is computed from the RGB value, a reversal monochrome picture can be acquired. Moreover, you may make it choose a specification color by making a window indicate various kinds of colors decided beforehand by list, in case color specification is performed, and carrying out tab control specification of the arbitrary colors with a pointing device from the inside. Furthermore, you may be made to specify a color by operating a Japanese-syllabary letter key and inputting the name of a color.

[0022]

[Effect of the Invention] According to this invention, a full color picture is efficiently convertible for the monochrome picture of a specification color only by specifying arbitrary colors out of various kinds of colors decided beforehand. Especially, the knowledge about complicated operation or a color is not needed, but it becomes convertible into a monochrome picture by the easy operation near one-touch or it.

[Translation done.]